



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/791,606	03/01/2004	Meng-Chi Hung	67,200-1129	2038
7590 12/13/2005				
TUNG & ASSOCIATES Suite 120 838 W. Long Lake Road Bloomfield Hills, MI 48302			EXAMINER	
			HARRISON, MONICA D	
			ART UNIT	PAPER NUMBER
			2813	

DATE MAILED: 12/13/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No. 10/791,606	Applicant(s) HUNG ET AL.	
	Examiner Monica D. Harrison	Art Unit 2813	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 March 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-27 is/are pending in the application.
- 4a) Of the above claim(s) 15-27 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☐ Claim(s) 1-14 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Election/Restrictions

1. Claims 15-27 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to a nonelected Group II, there being no allowable generic or linking claim. Applicant timely traversed the restriction (election) requirement in the reply filed on 10/28/05. Examiner acknowledges the election of Group I, claims 1-14.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-4 and 7-14 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhou et al (6,376,353 B1).

2. Regarding claim 1, Zhou et al discloses a method for forming an improved fuse link structure comprising the steps of: providing first and second metal interconnect structures each respectively electrically interconnected to form fuse interconnected portions extending through a plurality of dielectric insulating layers including an uppermost metal interconnect layer (Figure 3A, references 4 and 20); forming a dielectric insulating layer over the uppermost metal interconnect layer (Figure 3A, reference 14); forming at least a second dielectric insulating layer over the first dielectric insulating layer (Figure 3A, reference 16); forming first and second trench to respectively overlie the first and second metal interconnect structures (Figures 3A-3D, reference 20); forming first and second via openings extending from a bottom portion of the

Art Unit: 2813

respective first and second trench line openings through the dielectric insulating layer to overlie the respective first and second metal interconnect structures while simultaneously etching away a predetermined thickness of the at least a second dielectric insulating layer spanning an area between and overlying the first and second via openings (Figures 3A-3D, reference 19); and, filling the first and second via openings and first and second trench line openings with a metal to form a metal fuse link electrically interconnecting the first and second metal interconnect structures to form a metal fuse link portion comprising the predetermined thickness (Figures 3A-3D; *copper*)

3. Regarding claim 2, Zhou et al discloses wherein the second dielectric insulating layer comprises a lowermost dielectric insulating layer (Figure 3A, reference 14) and an uppermost dielectric insulating layer (Figure 3A, reference 16) separated by an etch stop layer (Figure 3A, reference 15) formed at a level comprising the predetermined thickness.

4. Regarding claim 3, Zhou et al discloses wherein etch stop layers are formed to separate the first dielectric insulating layer and the at least a second dielectric insulating layer (Figure 3A, reference 15).

5. Regarding claim 4, Zhou et al discloses wherein a metal interconnect guard ring structure is formed in parallel to surround the fuse link and the fuse interconnect portions to extend downward through at least a portion of the plurality of dielectric insulating layers (Figure 3A, reference 13).

6. Regarding claim 7, Zhou et al discloses wherein the metal is selected from the group consisting of copper, aluminum, and alloys thereof (column 7, line 49).

7. Regarding claim 8, Zhou et al discloses wherein the metal consists primarily of copper (column 7, line 49).

8. Regarding claim 9, Zhou et al discloses wherein the step of filling further comprises the steps of: depositing at least one of a refractory metal and refractory metal nitride to form a barrier layer lining the respective via and trench openings (Figure 3a, reference 13); depositing a copper seed layer over the barrier layer (column 7, lines 48-49; Figure 3A, reference 20); carrying out an electro-chemical deposition process to fill the respective via and trench openings (column 1, lines 48-53); and carrying out a chemical mechanical polishing process to remove excess copper overlying respective trench opening levels (column 3, lines 22-23).

9. Regarding claim 10, Zhou et al discloses wherein the predetermined thickness is from about 1500 Angstroms to about 5000 Angstroms (column 8, lines 25-27).

10. Regarding claim 11, Zhou et al discloses wherein the predetermined thickness is from about 2500 Angstroms to about 3500 Angstroms (column 8, lines 25-27).

11. Regarding claim 12, Zhou et al discloses wherein the first and at least a second dielectric insulating layer are formed of a material selected from the group consisting of undoped silicate glass (USG), CVD silicon oxide, PECVD silicon oxide, and TEOS silicon oxide (column 7, lines 46-47).

12. Regarding claim 13, Zhou et al discloses wherein the etch stop layer is selected from the group consisting of silicon carbide and silicon nitride (Figure 3A, reference 15).

13. Regarding claim 14, Zhou et al discloses wherein the at least a second dielectric insulating layer is formed at a thickness of from about 10,000 Angstroms to about 40,000 Angstroms (column 7, lines 51-55).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhou et al (6,376,353 B1) in view of Powers (6,562,711 B1).

14. Zhou et al discloses all above claimed subject matter except a BARC layer (claim 5) and an OSG layer (claim 6).

Powers discloses a BARC layer (column 5, line 36) and an OSG layer (column 4, lines 29-34).

It is obvious, at the time the invention was made, for one having ordinary skill in the art, to modify Zhou et al with the teachings of Powers for the purpose of using low-k dielectrics in order to reduce interlayer capacitance of interconnect structures.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Monica D. Harrison whose telephone number is 571-272-1959. The examiner can normally be reached on M-F 7:00am-3:30pm.

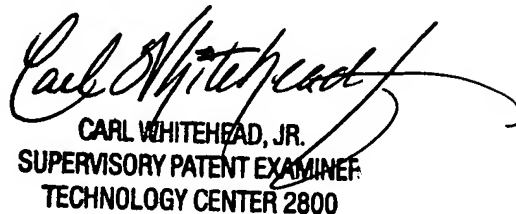
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Carl Whitehead Jr. can be reached on 571-272-1702. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Art Unit: 2813

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Monica D. Harrison
AU 2813

mdh
December 9, 2005


CARL WHITEHEAD, JR.
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2800